NCTS
National Center for Theoretical Sciences

Mathematical General Relativity
Analytic Aspects

Time
2024.4.1~5.27
14:20-16:20, every Monday
★ Except (4/22 or 4/29 TBD) and 5/20

Venue
Room 505,
Cosmology Building,
NTU
+WebEx Online Meeting

Speaker
Willie Wai-Yeung Wong
Michigan State University

Introduction & Purposes

This is a continuation of the course from first semester, but covering a different direction. The first semester focused mostly on the “geometry” that appears in the study of mathematical general relativity; to the extent that any “analysis” showed up it was limited to solving ordinary differential equations. In this course we will focus on the partial differential equations that occurs in mathematical general relativity, and discuss some strategies for studying them.

Prerequisites

Being comfortable in doing tensor computations in local coordinate systems in a Riemannian (or Lorentzian) context; a prior course in mathematical analysis/ advanced calculus is suggested. I will try to make the PDE arguments as elementary as possible.

Contact **Murphy Yu** murphyyu@ncts.tw

Registration More information

Outline & Descriptions

To get a more global and quantitative understanding of generic solutions to Einstein’s equation in general relativity, one needs to consider the associated geometric partial differential equations. This course will introduce the students to some of the basic issues that arise, and some of the strategies that have been developed, with the goal of enabling them to approach current literature with an informed background. A rough list of topics will include (more may be added if time permits):

1. Einstein's Equations as partial differential equations – type and gauge fixing.
2. The initial value problem for Einstein's equations and the constraint problem.
3. The physical expectation of finite speed of propagation.
4. Bel-Robinson Tensor and " super " - energy estimates for linearized Einstein equa- tions; waves and peeling.
5. (Time permitting) Something about global structures of space-time. Possible ideas: (A) overview of the general ideas behind the "stability of Minkowski space" and the "formation of trapped surfaces" (B) Symmetric reductions and " semilinearization", and applications.